



ELECTROCARDIOGRAPH

TECHNICAL FIELD

This invention relates to an electrocardiograph which is held on a chest portion of a subject by ~~suspension~~ suspension, etc. and can detect, display and transmit an electrocardiogram when a fit occurs in the subject.

BACKGROUND ART

~~An electrocardiograph is~~ Electrocardiographs are classified to as 12 leads ~~electrocardiograph~~ electrocardiographs and ~~a~~ portable Holter ~~electrocardiograph~~ electrocardiographs, in ~~a large category~~ categories. The 12 leads electrocardiograph is a large-sized electrocardiograph which is used in medical facilities such as a room for detecting physiology and in which a minute electrocardiogram in a short time at a rest ~~basically~~ is basically measured.

The Holter electrocardiograph can detect an electrocardiographic complex continuously for 24 hours because it is portable, so that an electrocardiographic complex in activities of daily living except for at a rest can be gained as data. However, there is a problem such that an abnormal electrocardiographic complex ~~can not~~ cannot be ~~gotten~~ easily achieved because ~~almost~~ most measured data are normal. Accordingly, many event type electrocardiographs which can measure an electrocardiogram upon occurrence of an oppressive feeling or ~~pains~~ pains, etc. of a chest (events) are commercialized.

However, every prior event type electrocardiograph is a single

electrode lead type, so that it is necessary ~~that~~ for the subject ~~grips to grip~~
 one electrode ~~by~~ with his hand and ~~put place~~ another electrode to his ~~bared~~
~~bare~~ chest for measurement. ~~Thus~~ Thus, the operation is ~~very~~ a large
 nuisance in the case ~~that~~ where there is an oppressive feeling in the chest or
 5 pains of the chest, and especially, it would be impossible for the subject ~~in~~ to
 whom the events are ~~occurred~~ occurring to measure.

DISCLOSURE SUMMARY OF THE INVENTION

As described above, the present invention is to provide an
 10 electrocardiograph which can measure an electrocardiographic complex
 easily at the occurrence of events in a subject, ~~display~~ display ~~it~~ the complex and
 transmit ~~it~~ the complex.

Accordingly, the present invention is to be constituted of a body case
 which is held on a chest of a subject and in which an electric circuit is
 15 installed inside thereof, a common electrode provided on a back surface
 which is a chest side of the body case, at least one pair of arm portions
 extending from the body case, electrocardiographic complex detecting
 electrodes provided on end portions of the pair of the arm portions
 respectively, a means for detecting an electrocardiographic complex of the
 20 subject based on signals from the electrocardiographic complex detecting
 electrodes, a display means for displaying the electrocardiographic complex
 detected by the means for detecting the electrocardiographic complex, a
 transmission means for transmitting the electrocardiographic complex
 detected by the means for detecting the electrocardiographic complex, and a
 25 switch means for starting to detect, display and transmit the

electrocardiographic complex by pressing the common electrode and the electrocardiographic complex detecting electrodes to a chest side so as to make them come in contact with the chest.

Accordingly, due to the present invention, the switch means can be
 5 operated by pressing the electrocardiograph by means of a motion similar to a natural motion done by the subject at the occurrence of the events, for instance, a motion for pressing the chest, the electrocardiographic complex can be detected by the electrodes coming in contact with the chest, and the measured result can be displayed and transmitted.

10 ~~Besides~~Further, it is desired that the switch means is constituted of a pair of push-down switches provided in a front surface of the body case, detection, display and transmission of the electrocardiographic complex are started when both of the push-down switches are pushed down at the same time for a specific period. Furthermore, it is also desired that the switch
 15 means is constituted of push-down switches provided in the electrodes respectively, and transmission of the electrocardiographic complex ~~are~~ is started when all of the push-down switches are pushed down for a specific period by pressing the body case to a human body side.

Moreover, it is desired that the electrodes are non-paste electrodes. It
 20 is desired that the non-paste electrode consists of a conductive synthetic resin including carbon-fiber. Thus, sufficient conductivity of the electrodes can be gained without applying the paste.

It is desired that the body case is suspended from a neck by a suspending means. The suspending means is a strap such as strings or ~~chains~~
 25 chains, etc. ~~Besides~~Further, the suspending means is detachable to the body

case by a detachable means. Thus, it can be prevented that the suspending means twines around the neck of the subject. It is desired that the detachable means is concretely constituted of magnets which are provided in both ends of the strap and plates for attachment consisting of a magnetic material such as iron, stainless steel, etc. and ~~providing~~ provided on specific positions of side surfaces of the body case respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1a is a front elevation of an electrocardiograph according to a first embodiment of the present invention and Fig. 1b is a rear elevation of it;

Fig. 2a is a block diagram of an electric circuit housed in a body case and Fig. 2b is a block diagram illustrating one example of a transmission device;

Fig. 3 is a flowchart diagram illustrating an operational example of the electric circuit; and

Fig. 4a is a front elevation of an electrocardiograph according to a second embodiment of the present invention and Fig. 4b is a side elevation of it.

BEST MODE FOR CARRYING OUT THE INVENTION

Hereinafter, a working mode of the present invention is explained by referring to the drawings.

One embodiment of an electrocardiograph according to the working mode of the present invention is shown in Figs. 1a and 1b. The electrocardiograph 1 is constituted of a body case 3 which is suspended from

a neck of a subject by a strap 2 to be held it on a chest of the subject and a pair of electrode arm portions 4 which extend from the body case 3 in both side directions respectively. ~~Besides~~Further, a common electrode 5 is provided on a surface 3a in a human body side of the body case 3 and
 5 detecting electrodes 6 for electrocardiographic complex-6 are provided on both end portions of the electrode arm portions 4 respectively. Generally speaking, one of the detecting electrodes 6 for electrocardiographic complex 6 is an anode and another of them is a cathode. Furthermore, the common electrode 5 and the detecting electrodes 6 for electrocardiographic complex-6
 10 are non-paste electrodes consisting of conductive synthetic resin material, ~~for instance~~ instance, a synthetic resin material including carbon fiber.

Furthermore, a display screen 7 consisting of a LCD panel, a pair of starting switches 8a and 8b, and a sound indicator 9 including a speaker are provided in a front surface 3b of the body case 3. ~~Besides~~Also, in this
 15 embodiment, the sound indicator 9 is a buzzer, but it is preferred that a notice or ~~alarm~~ alarm, etc. is indicated by a voice.

Moreover, the strap 2 comprises cords or chains and magnets 40 for attachment-40 are provided in both ends of it, so that the magnets 40 stick to plates for attachment 41 consisting of magnetic materials such as irons,
 20 stainless-~~steels~~ steels, etc. and providing in specific positions in side surfaces of the body case 3 as shown in Fig. 4b to hold the body case 3 in a chest portion of the subject. Furthermore, the magnets 40 can be removed from the plates for attachment when power more than a specific value is applied to the strap 2, so that an accident caused by the strap can be prevented.

25 An electric circuit for detecting the electrocardiographic complex

from signals detected by the electrodes 5, 6, indicating ~~it~~ the complex and transmitting ~~it~~ the complex is provided inside the body case 3. A block diagram illustrating one embodiment of operation in the electric circuit is shown in Fig. 2a.

5 In the block diagram, a signal detector 12 detects an ~~analogue~~ analog signal for the electrocardiographic complex based on change of an electric current value, change of a voltage value, or change of an ~~impedance~~ impedance, etc. ~~arisen~~ that arises between the electrodes 5, 6. An A/D converter 14 changes the ~~analogue~~ analog signal for the electrocardiographic complex to a digital signal which can be operated on in an operation unit 16. 10 The operation unit 16 is constituted of at least a central processing unit (CPU), random access memories (RAM), read only memories (ROM) and input/output ports (I/O) which are not shown in the figures, operates on input signals along a specific program and ~~changing~~ changes the input signals to output signals, and further controls the signal detector 12, the A/D converter 14, and a display unit 18 and a transmission unit ~~20~~ 20, as follows. 15 ~~Besides~~ Further, it is preferred that a pulse rate is detected from the electrocardiographic complex in the operation unit 16. It is preferred that the electrocardiographic complex operated in the operation unit 16 at a normal condition is stored in a memory unit 24 so as to be able to ~~operate~~ determine 20 whether the electrocardiographic complex detected at an event time is abnormal ~~and a level of it~~ by comparing a level of it with the stored electrocardiographic complex.

 Furthermore, a switch controller (SW controller) 22 is connected 25 with the starting switches 8a, 8b and judges whether both of them are

pressed ~~in~~ for a specific period, for ~~instance~~ instance, 5 seconds, and if so, starting the operation unit 16 and carrying out every operation.

Moreover, the display unit 18 is to display the electrocardiographic complex operated in the operation unit 16 ~~in~~ on the display screen 7, but it is
 5 preferred that not only the electrocardiographic complex but also the pulse rate and so on can be displayed.

~~Besides~~ Further, the transmission unit 20 transmits the electrocardiographic complex by an instruction from the operation unit 16. In this working mode, because there is a case that the subject has a ~~pacemaker~~ pacemaker,
 10 maker_pacemaker, the transmission unit 20 is constituted so that the electrocardiographic complex to be transmitted is transmitted to a receiver 32 mounted on a transmission device 30 such as a portable telephone as shown in Fig. 2b with a weak radio wave firstly, and then the transmission device 30 held on a waist or in a bag transmits it to a nurse center or a
 15 computer of a doctor for watching. Note that there is a power source such as batteries not shown in figures as the other constitution.

Explaining one embodiment of the operation carried out in the electric circuit constituted as ~~the detailed~~ above along with a flowchart diagram starting at a step 100 as shown in Fig. 3, it is judged in a step 110
 20 firstly whether the starting switch 8a (SW1) is pressed or not (ON?) and it is judged in a step 120 whether the starting switch 8b (SW2) is pressed or not (ON?). In these judgments, an operation can be advanced to a step 130 only in a case ~~of~~ where it is judged that both starting switches 8a, 8b are pressed at the same time. In the step 130, it is judged whether a condition that the
 25 both switches 8a, 8b are pressed is continued for t seconds (for instance, 5

seconds) or not.

In the above steps 110, 120 and 130, only in a case that ~~the both~~ the switches 8a, 8b are pressed for t seconds, it is confirmed that the subject wishes to measure the electrocardiographic complex. Namely, it can be
 5 judged that an action ~~that~~ where the starting switches 8a, 8b on the body case 3 ~~is~~ are pressed, for instance, for 5 seconds is done so that the subject presses the electrocardiograph 1 to his chest portion when the event (the pain of the ~~chest~~ chest, etc.) ~~is happened~~ is happening.

Then, the operation is advanced to a next step 140 and a buzzer for
 10 starting measurement is sounded in order to inform of the starting of the measurement to the subject in the step 140. Then, the operation is advanced to a step 150 and the electrocardiographic complex is detected or the electrocardiographic complex and the pulse rate are detected in the step 150. Then, advancing to a step 160, a buzzer for ending measurement is sounded
 15 in the step 160. In this case, for instance, seven short buzzer sounds are sounded to inform of the end of the measurement to the subject.

After that, advancing to a step 170, the electrocardiographic complex is displayed via the display unit 18 ~~to~~ on the display screen 7 for a specific period. Accordingly, when the subject wants to confirm the
 20 electrocardiographic complex, the subject takes out the electrocardiograph 1 from the chest portion and can watch the display screen 7. Besides, there is an advantage that the nurse can confirm the electrocardiographic complex of the subject at the time of occurrence of the event.

Then, advancing to a step 180, the electrocardiographic complex is
 25 transmitted to the transmission device 30 via the transmission unit 20.

Accordingly, because the nurse or the doctor can confirm the occurrence of the event in the subject and confirm the electrocardiographic complex at the time, suitable treatment can be done.

Hereinafter, explaining an electrocardiograph according to a second embodiment in Figs. 4a and 4b, some parts in this embodiment which are the same parts in the above mentioned embodiment or have the same effects are marked with the same reference numbers ~~to omit~~ and the explanations for them are omitted.

An electrocardiograph 1A according to the second embodiment ~~is~~
10 ~~has that the~~ starting switches that are unitedly installed to electrodes 5A, 6A respectively. Namely, the electrodes 5A, 6A come in contact with a human body by pressing a body case 3A to a side of the human body and are pressed, so that the electrodes 5A, 6A come in contact with the electric circuit to start the operation. Accordingly, structures of the electrodes 5A, 6A
15 become complicated, but the starting switches are turned on automatically by pressing the body case 3A so that the electrodes 5A, 6A come in contact with the human body strongly, and as a result, as movement of the subject can be decreased at the occurrence of the events, the measurement becomes easy.

20 Furthermore, in this embodiment, the starting switches are provided in the electrodes 5A, 6A unitedly, so that there is an effect that the display screen 7A can be made large.

INDUSTRIAL APPLICABILITY

25 As described above, according to the present invention, because an

electrocardiograph is suspended from a neck of a subject by a ~~strap etc. and~~
~~strap, etc.,~~ held on a chest portion of the subject, and an electrocardiographic
 complex is measured, displayed and transmitted by pressing the
 electrocardiograph held on the chest at occurrence of an event, detection,
 5 display and transmission of the electrocardiographic complex become
 possible in a nature motion of the subject, namely without a special motion
 of the subject, so that the electrocardiographic complex of the subject at an
 abnormal condition can be gained exactly.

~~Besides~~Further, because unnecessary measurement can be omitted, a
 10 waste of electricity can be decreased, so that ~~a~~ an effect that a life of a
~~battery~~ battery as a power source can be ~~extended~~ extended, etc. can be
 gained.

ABSTRACT

~~The present invention is to provide an~~ An electrocardiograph ~~which~~
~~can measure~~ measures an electrocardiographic complex easily at the
5 ~~occurrence of events in a subject,~~ display displays it and ~~transmit~~ transmits it.
~~This~~ The electrocardiograph ~~is to be constituted of~~ includes a body case
which is held on a chest of a subject ~~and in which an electric circuit is~~
~~installed inside thereof,~~ a common electrode provided on a back surface
~~which is a chest side of the body case,~~ at least one pair of arm portions
10 ~~extending from the body case,~~ ~~electrocardiographic complex~~ detecting
electrodes provided on end portions of the pair of the arm portions
respectively, ~~a means~~ unit for detecting an electrocardiographic complex of
the subject based on signals from the ~~electrocardiographic complex~~ detecting
electrodes, and ~~a display means~~ unit for displaying the electrocardiographic
15 ~~complex detected by the means for detecting the electrocardiographic~~
~~complex,~~ complex. The electrocardiograph also includes a transmission
~~means~~ unit for transmitting the electrocardiographic complex ~~detected by the~~
~~means for detecting the electrocardiographic complex,~~ and a switch ~~means~~
unit for ~~starting to the detect~~ detection, ~~display and transmit~~ transmission of
20 ~~the electrocardiographic complex by pressing the common electrode and the~~
~~electrocardiographic complex detecting electrodes to a chest side so as to~~
~~make them come in contact with the chest.~~